SEASONAL FOOD HABITS OF BARN OWLS IN UTAH

Dwight G. Smith,[1] Charles R. Wilson,[2] and Herbert H. Frost[2]

Abstact.— The food habits of a small colony of barn owls in central Utah were investigated from 30 January 1969 to 30 January 1970 to determine seasonal trends in prey species composition and abundance. An analysis of 783 pellets yielded 1845 prey individuals, of which mammals, primarily *Microtus*, were the most abundant during all seasons of the year. A wide variety of avian prey species revealed an opportunistic aspect of barn owl prey selection.

A majority of the numerous studies of barn owl (*Tyto alba*) food habits were determined from sporadic pellet collections deposited by an unknown number of owls over an indefinite period of time. Several exceptions include the investigations of the daily and seasonal food of barn owls in Davis, California (Evans and Emlen, 1947), the report of seasonal food habits of barn owls from 14 locales in England and Wales (Glue, 1967), the analysis of annual changes in the diet of barn owls in France (Saint Girons, 1968), and a long term study of the food habits of this owl in Germany (Uttendorfer, 1952). Our objective was to determine the seasonal food habits of a small colony of barn owls in central Utah. Prior to this study the barn owl was considered to be an uncommon permanent resident in Utah, and there was little information on its feeding ecology and economic status from this part of the Great Basin.

The colony was in the abandoned Ironton Steel Mill near Springville, Utah Co., Utah—a complex of 60 major brick and steel structures on approximately 500 acres of land. The colony numbered 26 individuals in the winter of 1968 but had increased to 38 individuals by late June 1969. From July 1969 through January 1970 the colony declined to 10 individuals. Large numbers of pigeons (*Columba livia*), starlings (*Sturnus vulgaris*), and house sparrows (*Passer domesticus*) also used the mill. The barn owls hunted within the steel mill complex and in adjacent habitats. Although the interior of the steel mill was largely devoid of vegetation, the adjacent habitats included extensive cattail (*Typha* sp.) marshes, cheat grass (*Bromus tectorum*) fields, and several shallow ponds. On the basis of 750 trap nights the most common small mammals within these habitats included meadow mice (*Microtus pennsylvanicus*), deer mice (*Peromyscus maniculatus*), house mice (*Mus musculus*), and vagrant shrews (*Sorex vagrans*).

Methods

The food habits of the barn owls were determined from pellet collections—the most practicable method, despite necessary limitations, for accumulating massive data on the food habits of nocturnal raptors (Errington, 1967; Southern, 1969). Pellets were collected

[1]Department of Biology, Southern Connecticut State College, New Haven, Conn. 06515.
[2]Department of Zoology, Brigham Young University, Provo, Utah 84601.

biweekly from beneath the roosts of adult birds of the colony and separated into four time groupings, each representative of a seasonal period of barn owl activity and roughly corresponding with one of the four seasons. The spring period from 2 March to 1 June corresponded with the reproductive activities of the barn owl population; the summer period from 2 June to 1 September was characterized by the attentiveness of the adults to the newly fledged but still dependent young; the autumn period from 2 September to 1 December included the abandonment and subsequent dispersal of the majority of the young from the colony; and from 2 December through 1 March the remaining owls moved into well-protected winter residence structures.

Pellet analysis followed methods described by Marti (1969). Individual prey remains were identified by comparison with mammal and avian specimens of the Brigham Young University Life Sciences Museum natural history collections.

Pellet Deposition and Composition

Guérin (1928) reported that in France adult barn owls usually deposited two pellets per 24 hours. The first pellet is dropped about dawn on the hunting territory, while the second pellet is deposited at the roosting site before the owl resumes its hunting the following evening. We did not attempt to locate pellets dropped by the barn owls of Ironton on the hunting territory. At their roosting sites they deposited an average of one pellet per day during spring, summer, and early autumn, but this rate frequently declined during late autumn and winter. This decline in the winter pellet deposition rate correlated with severe weather conditions, and during several periods of snow cover and extreme cold no pellets were deposited for one to two days by one or more of the adult owls.

Spring and summer pellets were strikingly larger and averaged almost twice as many prey individuals per pellet than pellets found in autumn and winter (Table 1). In addition, summer pellets contained up to eight prey individuals per pellet compared to a maximum of five individuals per pellet from the autumn and winter pellets. The smallest pellets were found during rigorous winter conditions and usually contained but one prey individual. Errington

Table 1. Seasonal trends in pellet composition.

Season	No. Pellets Collected	Total No. Indv.	No. Indv. per Pellet	Range	Av. Dry Wt. of Pellets in grams*
Spring	346	889	2.6	1-7	10.6
Summer	198	509	2.6	1-8	9.1
Autumn	117	234	1.9	1-5	4.6
Winter	122	213	1.7	1-4	3.1
Totals	783	1845	Av. 2.2	Av. 1-6	

*Determined from 100 randomly selected pellets from each season, which were air dried for 10 days.

(1931) and Stewart (1952) also noted a progressive decline in the size of the pellets deposited by barn owls during adverse climatic conditions and reported that several of their owls subsequently died of starvation. Although none of the barn owls of Ironton died during winter, it is probable that their populations in Utah and other more northern parts of their range may be limited by inherent food procurement difficulties during severe weather conditions.

Composition of Diet

There were 1845 prey individuals of 21 different species, including eight mammalian and 13 avian prey species (Table 2). On an annual basis, mammals comprised 90% of the total prey and were the most common prey of every season, although the frequency of their occurrence declined significantly during autumn ($x^2 = 35.8$, $P > 0.001$, $df = 3$). In contrast, the frequency of avian prey, while comprising only 10% on an annual basis, doubled during autumn.

Meadow mice were the most abundant mammalian prey species and appear to represent the single most important food item (81%) of the barn owls at Ironton. Other important mammal prey species included deer mice and house mice, but neither these nor any of the remaining mammal species comprised over 3% of the barn owl diet.

Only two avian species were present in pellets from every season: the starling, which was the second most common prey species, comprising 6.2% of the total annual prey; and the house sparrow, which comprised 2.4% of the total annual prey. Both species nested in Ironton and adjacent locales, and large flocks roosted within the buildings during the autumn and winter months. The frequency of their occurrence as prey rose signficantly during autumn ($x^2 = 16.9$, $P > 0.001$ and $x^2 = 23.4$, $P > 0.001$ for the starling and house sparrow respectively), coinciding with the sharp rise in their populations.

The majority of the other avian prey species were migrants taken infrequently. Especially large numbers of transient birds fed and roosted in the marshes and fields bordering Ironton, and the spring occurrence of a lesser yellowlegs (*Totanus flavipes*) and early autumn occurrence of bank swallows (*Riparia riparia*) and red-winged blackbirds (*Agelaius phoeniceus*) indicate that these migrants occasionally present suitable prey for barn owls. The occurrence of lesser yellowlegs and American coot (*Fulica americana*) reveals that barn owls may take larger birds, although these must approach the upper limits of the prey-size capabilities of the owls. Domestic pigeons were rarely found in the prey items, despite their abundance within the mill.

The American kestrel (*Falco sparverius*) prey individual was a recently fledged juvenile. Kestrels frequently perched in open, exposed locations during the late evening hours at the time when barn owls were initiating their nocturnal hunts; this individual was probably taken during this slight overlap in the activity periods of the two species. In contrast, essentially no overlap occurred during the

TABLE 2. Seasonal trends in number and occurrence of prey species of adult barn owls.

Prey species	Spring		Summer		Autumn		Winter		Totals	
	No.	%	No.	%	No.	%	No.	%	No.	%
Microtus pennsylvanicus	753	84.7	426	83.6	152	65.0	171	80.0	1502	81.4
Phenacomys intermedius	9	1.0	9	1.8	13	5.6	2	0.9	33	1.8
Mus musculus	18	2.0	9	1.8	7	3.0	7	3.2	41	2.0
Sorex vagrans	8	0.9	4	0.8	4	1.7	2	0.9	18	1.0
Peromyscus maniculatus	18	2.0	22	4.3	8	3.4	6	3.0	54	2.9
Rattus norvegicus	1	0.1	1	0.2	3	1.3	2	0.9	7	0.4
Thomomys bottae	2	0.2	5	0.8	0	0.0	0	0.0	7	0.4
Sylvilagus auduboni	0	0.0	1	0.2	0	0.0	0	0.0	1	0.05
Total mammals	809	90.9	477	93.5	187	80.0	190	88.9	1663	90.0
Sturnus vulgaris	54	6.1	21	4.1	28	12.0	13	6.1	116	6.2
Passer domesticus	13	1.5	7	1.4	14	6.0	10	4.7	44	2.4
Columba livia	2	0.2	0	0.0	3	1.3	0	0.0	5	0.3
Agelaius phoeniceus	2	0.2	0	0.0	1	0.4	0	0.0	3	0.2
Falco sparverius	0	0.0	1	0.2	0	0.0	0	0.0	1	0.05
Molothrus ater	2	0.2	0	0.0	0	0.0	0	0.0	2	0.1
Fulica americana	2	0.2	0	0.0	0	0.0	0	0.0	2	0.1
Colaptes cafer	2	0.2	0	0.0	0	0.0	0	0.0	2	0.1
Totanus flavipes	1	0.1	0	0.0	0	0.0	0	0.0	1	0.05
Turdus migratorius	1	0.1	1	0.2	0	0.0	0	0.0	2	0.1
Riparia riparia	0	0.0	0	0.0	1	0.4	0	0.0	1	0.05
Colaptes auratus	1	0.1	1	0.2	0	0.0	0	0.0	2	0.1
Lophortyx californicus	0	0.0	1	0.2	0	0.0	0	0.0	1	0.05
Total birds	80	8.9	32	6.3	47	20.1	23	10.8	182	9.8
Grand Totals	889	99.8	509	99.8	234	100.1	213	99.7	1845	99.8

early morning hours because barn owls began roosting from one to three hours before kestrels were active.

In addition to the vertebrate prey species, some vegetable matter was recovered from the pellets. This material almost certainly represents the gut contents of the prey, and that which could be identified included fruits of Russian olive (*Elaeagnus angustifolia*) and seeds of various grasses (Graminae).

Discussion

The barn owls at Ironton were supported exclusively by the mammal and avian communities, despite the seasonal availability of large invertebrate (primarily Insecta) and amphibian populations. The year-round predominance of small rodents in their diet is in agreement with the findings of similar investigations from other areas of the range. This, coupled with the conspicuous lack of invertebrates in their spring and summer diets, indicates selective predation.

Within the limitations of their food habits, however, the barn owls at Ironton exhibited a considerable degree of opportunism. Hawbecker (1945) and Wallace (1948) noted that the owls of their respective studies tended to prey heavily on the most available animals of a community. Predation on the basis of availability is reflected in the present study by the high frequency of occurrence of *Microtus pennsylvanicus*, which was the most common mammal in the area.

The opportunism of barn owl predation is also revealed by both the variation in total number of prey species taken in the different seasons and the changes in seasonal frequency of several of the prey species. The largest variety of prey species were taken in the spring and summer months when transients and summer nesting birds greatly increased the potential prey available to the local barn owl population. In contrast, fewer different prey species were recorded from the decreased fauna of the autumn and winter months.

The changes in seasonal frequency of several of the prey species was also a function of their comparative exposure at different times of the year. This is shown by the autumn increase in the frequency of occurrence of starlings and house sparrows, whose increased autumn populations and preroosting flight behavior during the evening hours undoubtedly heightened their exposure to barn owl predation.

We conclude that the ability of the Ironton barn owls to effectively exploit the local prey populations was revealed by (1) their heavy utilization of the most abundant prey species, (2) their predation on additional species when available at specific times of the year, and (3) their response to local fluctuations of prey populations.

References

Errington, P. L. 1931. Winter killing of barn owls in Wisconsin. Wilson Bull. 43:60.

Errington, P. L. 1967. Of predation and life. Iowa State University Press, Ames. 277 p.

Evans, F. C., and J. T. Emlen, Jr. 1947. Ecological notes on the prey selected by a barn owl. Condor 49:3-9.

Glue, D. E. 1967. Prey taken by the barn owl in England and Wales. Bird Study 14:169-183.

Guérin, G. 1928. La vie des chouettes. Regime et croissance de l'effraye commune *Tyto alba alba* (L) en Vendee. P. Lechevalier, Paris. 157 p.

Hawbecker, A. C. 1945. Food habits of the barn owl. Condor 47: 161-166.

Marti, C. D. 1969. Some comparisons of the feeding ecology of four owls in north-central Colorado. Southwestern Natur. 14:163-170.

Saint Girons, M. 1968. Analyse des fluctuations du regime de l'effraye, *Tyto alba* dans le department de la somme (Nord de la France) pendant une pullulation de *Microtus arvalis*.

Stewart, P. A. 1952. Winter mortality of barn owls in central Ohio. Wilson Bull. 64:164-166.

Southern, H. N. 1969. Prey taken by tawny owls during the breeding season. Ibis 111:293-299.

Uttendorfer, O. 1952. Neue ergebnisse uber die ernahrung der Greifvogel und Eulen. Eugen Ulmer, Stuttgart.

Wallace, G. J. 1948. The barn owl in Michigan: its distribution, natural history, and food habits. Tech. Bull., Agric. Exp. Sta., Michigan 208:1-61.